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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/699,126      | 10/30/2003  | Mi-Suk Lee           | 3364P147            | 4970             |

8791 7590 08/28/2007  
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| EXAMINER |
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HARPER, VINCENT PAUL

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| ART UNIT | PAPER NUMBER |
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2626

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08/28/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                               |                            |  |
|------------------------------|-------------------------------|----------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/699,126 | Applicant(s)<br>LEE ET AL. |  |
|                              | Examiner<br>V. Paul Harper    | Art Unit<br>2626           |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sohn et al. ("A Statistical Model-Based Voice Activity Detection" IEEE Signal processing Letters, Vol. 6, NO. 1, January 1999), hereinafter referred to as Sohn, and in view of Martin ("Speech enhancement using MMSE short time spectral estimation with gamma distributed priors" In: Proc. IEEE ICASSP. pp. 504-512 May 13-17, 2002.), hereinafter referred to as Martin, and Gustavsson et al. ("Simultaneous channel and symbol maximum likelihood estimation in Laplacian noise" ICSP 1998), hereinafter referred to as Gustavsson.

Regarding **claim 1**, Sohn teaches a method for statistical model-based voice activity detection. Shon's teachings include:

- a fast frequency Fourier transformer for performing a fast Fourier transform on input speech to analyze speech signals of a time domain in a frequency domain (§II, ¶1, DFT of speech);

- a noise power estimator for estimating a power  $\lambda_{n,k}(t)$  of noise signals from noisy speech  $X(k)$  of the frequency domain output from the fast frequency Fourier transformer (§II, ¶1, estimate speech, noise and noisy speech); and
- a likelihood ratio test (LRT) calculator for calculating a decision rule of voice activity detection (VAD) from the estimated power  $\lambda_{n,k}(t)$  of noise signals from the noise power estimator ... (p. 1, col. 2, eqn. (3), likelihood ration calculation);
- wherein the decision rule is a geometrical average of likelihood ration ... [see first equation in claim 1] (col. 2, eqn (3));
- where hypothesis H0 represents the case of absence of speech; hypothesis H1 represents the case of presence of speech; and  $X_k$  is the k-th discrete Fourier coefficient, and the likelihood ration using the Laplacian statistic module is determined by the following equation [see second equation in claim 1] (note the equivalence indicated in the claimed equation and the fact that the right hand side equation necessary follows from the left hand side equation [taught by Sohn] with the additional assumptions [use of Laplacian models] given by Martin and Gustavsson [see below]).

But Sohn does not specifically teach the use of a “complex Laplacian probabilistic statistical model [representing speech]” in the likelihood ratio test.

However, the examiner contends that this concept was well known in the art, as taught by Martin.

In the same field of endeavor, Martin teaches the use of a Laplacian model for speech (§2.1 Statistical Models).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Sohn by specifically replacing the Gaussian model used in the LRT with a Laplacian model, as taught by Martin, because it is well known in the art at the time of invention that the Laplacian model is an improvement over the Gaussian model when modeling speech (Martin, §2.1 Statistical Models ¶1).

But Sohn does not specifically teach the use of a “complex Laplacian probabilistic statistical model [representing noise]” in the likelihood ratio test. However, the examiner contends that this concept was well known in the art, as taught by Gustavsson.

In the same field of endeavor, Gustavsson teaches the use of a Laplacian model for noise (§1 Introduction, ¶2)

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Sohn by specifically replacing the Gaussian model used in the LRT with a Laplacian model, as taught by Gustavsson, because it is well known in the art at the time of invention that the Laplacian model is an improvement over the Gaussian model when modeling speech (Gustavsson, col. 1, ¶4, some noise environments are actually non-Gaussian and in these cases a Laplacian model might be a better representation).

Regarding **claim 4**, this claim has limitations similar to claim 1 and is rejected for the same reasons.

***Response to Arguments***

2. Applicant's arguments filed 8/3/2007 have been fully considered but they are not persuasive.

3. Applicant asserts on page 5:

Further, even though Gustavsson discusses Laplacian noise, Gustavsson asserts that noise described by the Laplacian model is more impulsive than a Gaussian model; estimation and detection in Laplacian environments is notably more complex; and *that the combined requirements for an analytically tractable model and for physical representation are often contradictory* (Gustavsson, column 1, paragraph 4 to column 2). Therefore, the assertion in the Office Action on page 4, third paragraph, stating that the Laplacian model might be a better representation seems contradicted in Gustavsson. (Italics added)

The examiner asserts that the statement above in italics supports the motivation given in the office action that "a Laplacian model might be a better representation" since Gustavsson's statement implies that there might be a computational price to pay for an (improved/more accurate) physical representation. Gustavsson's paper then goes on to describe channel estimation and signal detection in Laplacian noise.

4. Applicant further asserts on page 5:

Moreover, Martin discloses results using Laplacian noise model that are slightly better than a Gaussian model (see Martin, page 1-256, column 2, Table 1), but that using a Gaussian/Gamma model shows consistent improvement in speech estimation. This teaches away from using a Laplacian noise model.

Martin states that "[t]he improvement using the Laplace/Gamma estimator is somewhat smaller, but as listening tests confirm, significantly less "musical noise" is audible." The examiner maintains that this statement supports the use of the Laplacian model since it results in less "musical noise."

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to V. Paul Harper whose telephone number is (571) 272-7605. The examiner can normally be reached on M-F.

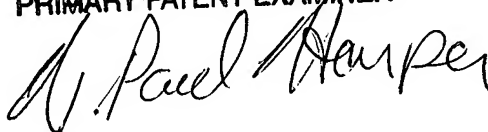
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571) 272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

8/24/07

VPH

V. PAUL HARPER  
PRIMARY PATENT EXAMINER

A handwritten signature in cursive script that reads "V. Paul Harper". The signature is written in black ink and is positioned below the printed name and title.